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Arabian Gulf operational wave forecast validation using Satellite Altimeters

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Accurate wave forecasting is important for the Arabian Gulf due to extensive navigation and various other offshore activities. The Arabian Gulf is an elongated water body with an approximate length of 1000 km and width of 330 km. The major wind forcing feature in the area is the shamal, a strong wind from the north, channeled along the axis of the Gulf. These unique features of this region make it difficult for global low-resolution wind and wave forecast systems to provide accurate forecasts. A regional wind and wave forecasting system for the Arabian Gulf has therefor been developed and is currently operational on the RAAD Linux cluster at Texas A&M University at Qatar. The system has been developed based on the regional version of the "WRF" weather model and "SWAN" wave model. We have set up a 48-hour wind and wave forecasting system based on initial conditions from US National Oceanic and Atmospheric Administration, known as the "NCEP/GFS". Our current forecasting configuration is based on the 0000 GMT global forecast every day. A specific assessment of forecast skill will enable users to have appropriate confidence in wave forecasts. The lack of spatial coverage is the main drawback of using buoy data for wave validation. The availability of satellite altimeter data provides an alternative opportunity to validate wave forecasts. Wave heights recorded by JASON-2, CARYOSAT-2 and SARAL/ALTIKA satellites were collected from January 2015 to December 2016 and a comprehensive assessment was carried out. The shallow depth and presence of small islands and lagoons causes some contamination of altimeter data and careful quality control procedures were developed for removing erroneous data. Satellite flight protocols do not readily lend themselves to straightforward model-data comparisons. While model predictions are available for each hour, satellite data are often available at widely varying "lead times" relative to the forecast. For SARAL/ALTIKA, the lead times are 2 hour, 15 hours , 26 hours and 39 hours; for JASON and CRYOSAT-2 they are irregular and hence grouped in to 6 hour intervals(e.g. 0-6 hour , 6-12 hour, etc.) Various error statistics are obtained which can be used by the forecast users to establish bounds on the likelihood of a particular forecasted condition actually occurring.